CEIT – 04 – 502A
EE04L / MWF / 4:30p – 6:00p
LABORATORY REPORT 5

GROUP 6
Group Members:
Bernardo, Raevon Thaddeus C.
Bertumen, Charles Jefferson
Cabanes, Christine Joy P.
Cesar, John Lester M.
Landicho, Bhaves Nicolette D.
Solis, Johnloyd P.

Machine Problem 5: Curve Fitting Techniques

Program Name: Group 6 Curve Fitter Program

Acronym: G6–CFP

Current Version: 1.0.1

Version History:

- **1.0.1**
- Designed in Scilab version 6.0.2
- Features two program modes: **Linear Regression** and **Nonlinear Regression**
- **Nonlinear Regression** mode features two program types: **Polynomial of Degree of Two** and **Logarithmic**
- Features much improved User Interface (UI) as compared to its predessors
- Algorithm contains much more efficient **clock** features

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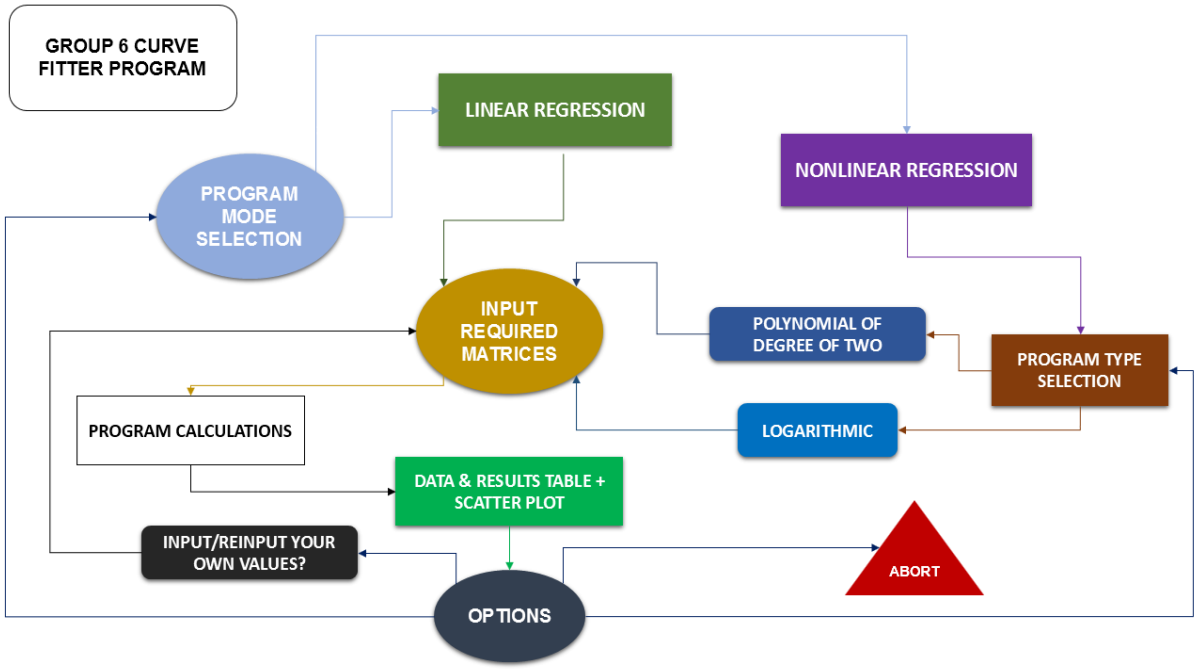
I. Flow Chart



The program starts with the main page which is the program mode selection page. In this page, the user will be able to choose between which program mode, be it either **Linear Regression** or **Nonlinear Regression,** to go with accordingly. Upon selecting the Linear Regression mode, the user will be prompted by the program to input X and Y matrices in accordance to the data set desired by the user. The program will then start computing for the values needed and will also provide data visualization through generated tables. The equation of the straight line will also be presented by the program. A scatter plot graph will also be presented to the user. Meanwhile in the Nonlinear Regression mode, the user will be able to choose between two program types: **Polynomial of Degree of Two** and **Logarithmic**. Similar with the Linear Regression prompts, the user will also be prompted by the program to input matrices of their desired data set. After the program computes for the values and presents the scatter plot, the user will be given an option to reinput Xi values if ever the user wants to determine a certain f(x) value. Finally, the user will be given certain options at the end that will either lead the user back to the program mode selection page, program type selection page, logarithmic type selection page or the program's abort page.

II. Program Instructions

How to Use G6-CFP 1.0.1:

Program Mode Selection

In this page, you can choose between which type of program do you want to proceed with. The choices of the user are (a) **Linear Regression** (b) **Nonlinear Regression**.

Linear Regression Mode

In this page, you will be prompted by the program to input **X** and **Y** matrices that corresponds to your desired data set (see example below to understand the mechanics of inputting your own matrices). Also, you will have the option later on to input your own **Xi** value/s. At the further end, you will prompted to choose from the options provided to you by the program.

Nonlinear Regression Mode: Program Type Selection

In this page, you can choose between which nonlinear type are you going to proceed with. The choices of the user are (a) **Polynomial of Degree of Two** and (b) **Logarithmic**.

Nonlinear Regression Mode: Polynomial of Degree of Two

In this page, you will be prompted by the program to input **X** and **Y** matrices that corresponds to your desired data set (see example below to understand the mechanics of inputting your own matrices). Also, you will have the option later on to input your own **Xi** value/s. At the further end, you will prompted to choose from the options provided to you by the program.

Nonlinear Regression Mode: Logarithmic

In this page, you can choose between which nonlinear type are you going to proceed with. The choices of the user are (a) $\mathbf{y = ab^x}$, (b) $\mathbf{y = ax^b}$ and (c) $\mathbf{y = ae^{bx}}$.

Nonlinear Regression Mode: $y = ab^x$ / $y = ax^b$ / $y = ae^{bx}$

In this page, you will be prompted by the program to input **X** and **Y** matrices that corresponds to your desired data set (see example below to understand the mechanics of inputting your own matrices). Also, you will have the option later on to input your own **Xi** value/s. At the further end, you will prompted to choose from the options provided to you by the program

.

How to input your own matrices:

e.g. (2, 3), (3, 5), (4, 7), (5 ,10) = desired data set

then....

Please input your X matrix: [2 3 4 5]

Please input your Y matrix: [3 5 7 10]

III. Sample Output

PROGRAM MODE SELECTION PAGE:

```
Welcome to Group 6 Curve Fitter Program 1.0.1!

Program Mode Selection:

a.) Linear Regression
b.) Nonlinear Regression

Please choose your desired program mode:
```

NONLINEAR REGRESSION: PROGRAM TYPE SELECTION PAGE

```
Program Mode: Nonlinear Regression
Type of Nonlinear:

a.) Polynomial of Degree of Two
b.) Logarithmic

Please choose which type of nonlinear:
```

NONLINEAR REGRESSION: LOGARITHMIC TYPE SELECTION PAGE

```
Program Mode: Nonlinear Regression
Nonlinear Type: Logarithmic
Type of Logarithmic:

a.) y = ab^x
b.) y = ax^b
c.) y = ae^(bx)

Please choose which type of nonlinear:
```

ABORT PAGE

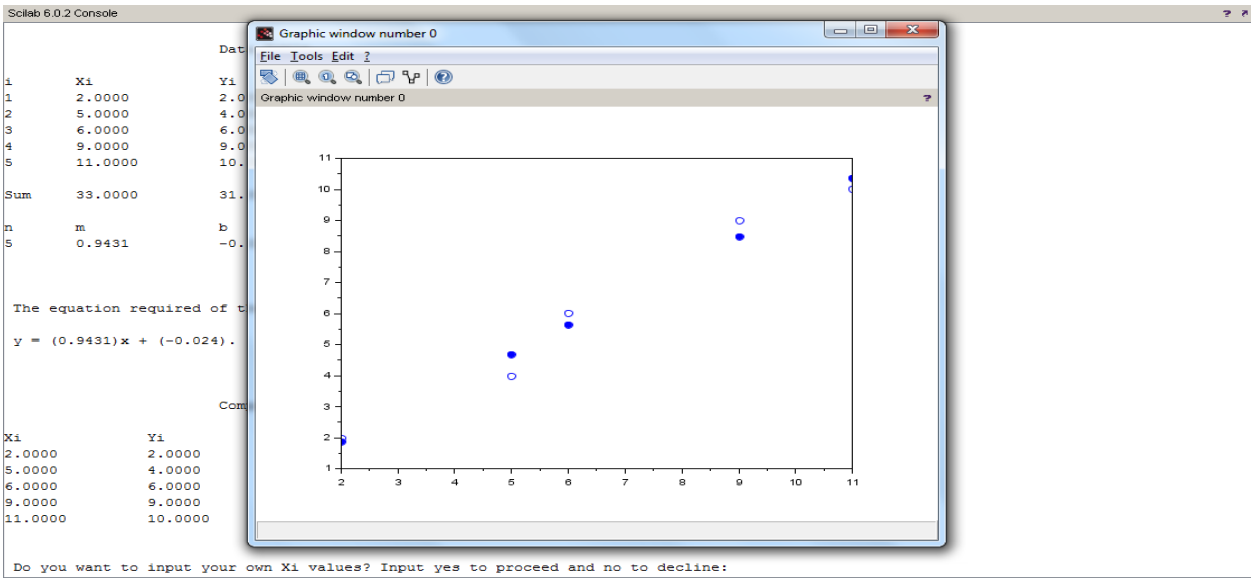
```
Thank you for using our program!
For any inquiries, contact Head Developer through this enail:
bernardoraevon@gmail.com
-->
```

LINEAR REGRESSION

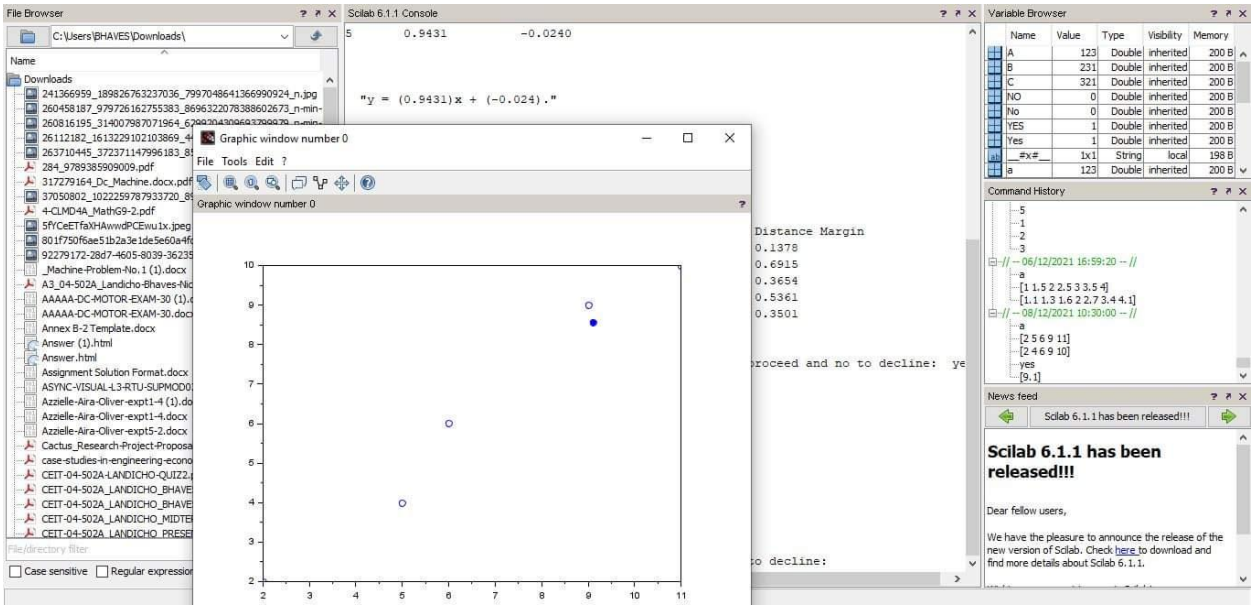
Scilab 6.0.2 Console

```
 Program Mode: Linear Regression


 Please input X matrix:  [2 5 6 9 11]

 Please input Y matrix:  [2 4 6 9 10]


                        Data Table

i       Xi              Yi              XiYi            X^2
1       2.0000          2.0000          4.0000          4.0000
2       5.0000          4.0000          20.0000         25.0000
3       6.0000          6.0000          36.0000         36.0000
4       9.0000          9.0000          81.0000         81.0000
5       11.0000         10.0000         110.0000                121.0000

Sum     33.0000         31.0000         251.0000                267.0000

n       m               b
5       0.9431          -0.0240



 The equation required of the straight line is:

 y = (0.9431)x + (-0.024).
```

```
                        Comparison Table

Xi              Yi              Yi (Calculated)         Distance Margin
2.0000          2.0000          1.8622                  0.1378
5.0000          4.0000          4.6915                  0.6915
6.0000          6.0000          5.6346                  0.3654
9.0000          9.0000          8.4639                  0.5361
11.0000         10.0000         10.3501                 0.3501


 Do you want to input your own Xi values? Input yes to proceed and no to decline:
```



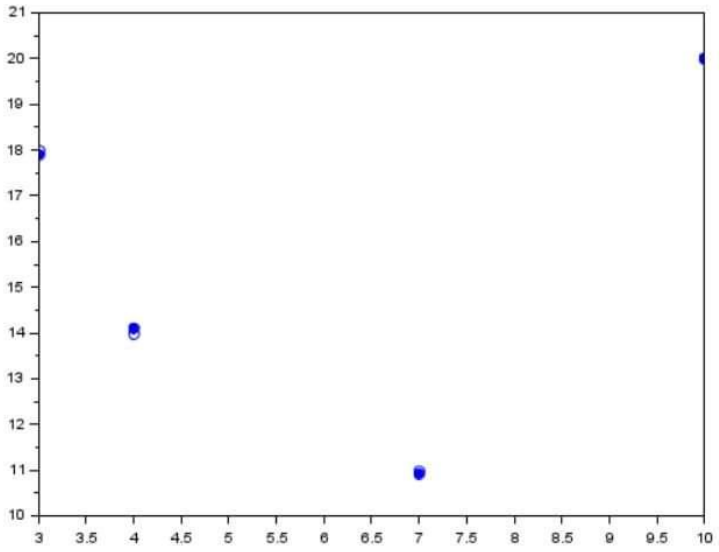
```
 Do you want to input your own Xi values? Input yes to proceed and no to decline:  yes


 Please input your desired Xi matrix:  [9.1]


          Results Table

Xi              Yi (Calculated)
9.1000          8.5582
WARNING: X and Y must be vectors of the same length.


 Reinput Xi values again?: Input Yes to proceed and No to decline:
```



NONLINEAR REGRESSION: POLYNOMIAL OF DEGREE OF TWO

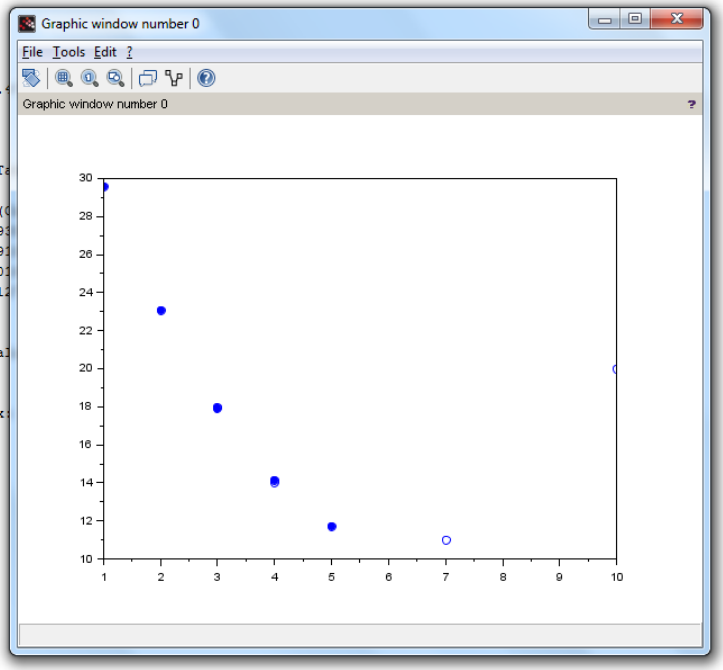
```
"Program Mode: Nonlinear Regression"

"Nonlinear Type: Polynomial of Degree of Two"


Please input X matrix:  [7 3 10 4]

Please input Y matrix:  [11 18 20 14]


                        Data Table

i       Xi              Yi              XiYi            Xi^2Yi
1       7.0000          11.0000         77.0000         539.0000
2       3.0000          18.0000         54.0000         162.0000
3       10.0000         20.0000         200.0000                2000.0000
4       4.0000          14.0000         56.0000         224.0000

Sum     24.0000         63.0000         387.0000                2925.0000


X^2             X^3             X^4
49.0000         343.0000                2401.0000
9.0000          27.0000         81.0000
100.0000                1000.0000               10000.0000
16.0000         64.0000         256.0000

174.0000                1434.0000               12738.0000

n       a               b               c
4       0.6818          -8.5636         37.4727
```

```
"y = (0.6818)x^2 + (-8.5636)x + (37.4727)."

"The required best fit curve is:"



                        Comparison Table

Xi              Yi              Yi (Calculated)         Distance Margin
7.0000          11.0000         10.9357                 0.0643
3.0000          18.0000         17.9181                 0.0819
10.0000         20.0000         20.0167                 0.0167
4.0000          14.0000         14.1271                 0.1271


Do you want to input your own Xi values? Input yes to proceed and no to decline:
```




```
 Do you want to input your own Xi values? Input yes to proceed and no to decline:  YES


 Please input your desired Xi matrix:  [1 2 3 4 5]


          Results Table

Xi              Yi (Calculated)
1.0000          29.5909
2.0000          23.0727
3.0000          17.9181
4.0000          14.1271
5.0000          11.6997


 Reinput Xi values again?: Input Yes to proceed and No to decline:
```

```
 The required best fit curve is:

 y = (0.6818)x^2 + (-8.5636)x + (37.4

                       Comparison Te

Xi              Yi              Yi (C
7.0000          11.0000         10.9
3.0000          18.0000         17.9
10.0000         20.0000         20.0
4.0000          14.0000         14.1


 Do you want to input your own Xi val


 Please input your desired Xi matrix:


          Results Table

Xi              Yi (Calculated)
1.0000          29.5909
2.0000          23.0727
3.0000          17.9181
4.0000          14.1271
5.0000          11.6997


 Reinput Xi values again?: Input Yes to proceed and No to decline:
```



NONLINEAR REGRESSION: LOGARITHMIC (A)

```
Please input X matrix:  [1 5 7 9 12]

Please input Y matrix:  [10 15 12 15 21]
```

Data Table

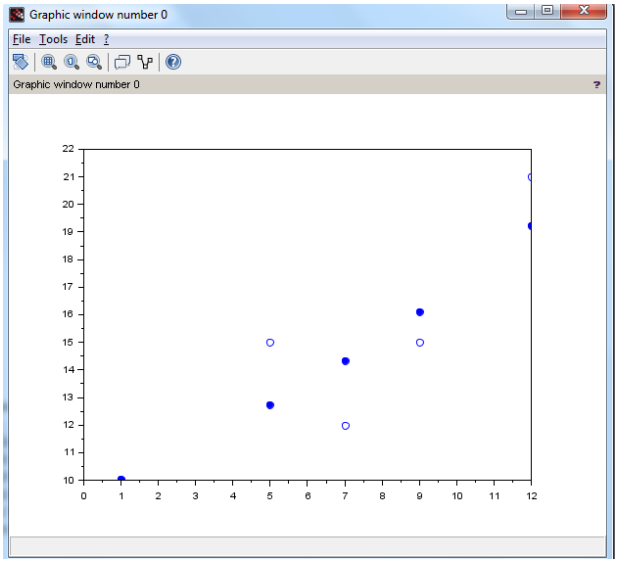
i	Xi	Yi	Yi=ln(yi)	XiYi	X^2
1	1.0000	10.0000	2.3026	2.3026	1.0000
2	5.0000	15.0000	2.7081	13.5405	25.0000
3	7.0000	12.0000	2.4849	17.3943	49.0000
4	9.0000	15.0000	2.7081	24.3729	81.0000
5	12.0000	21.0000	3.0445	36.5340	144.0000
Sum	34.0000		13.2482	94.1443	300.0000

n	m	b
5	1.0608	9.4754

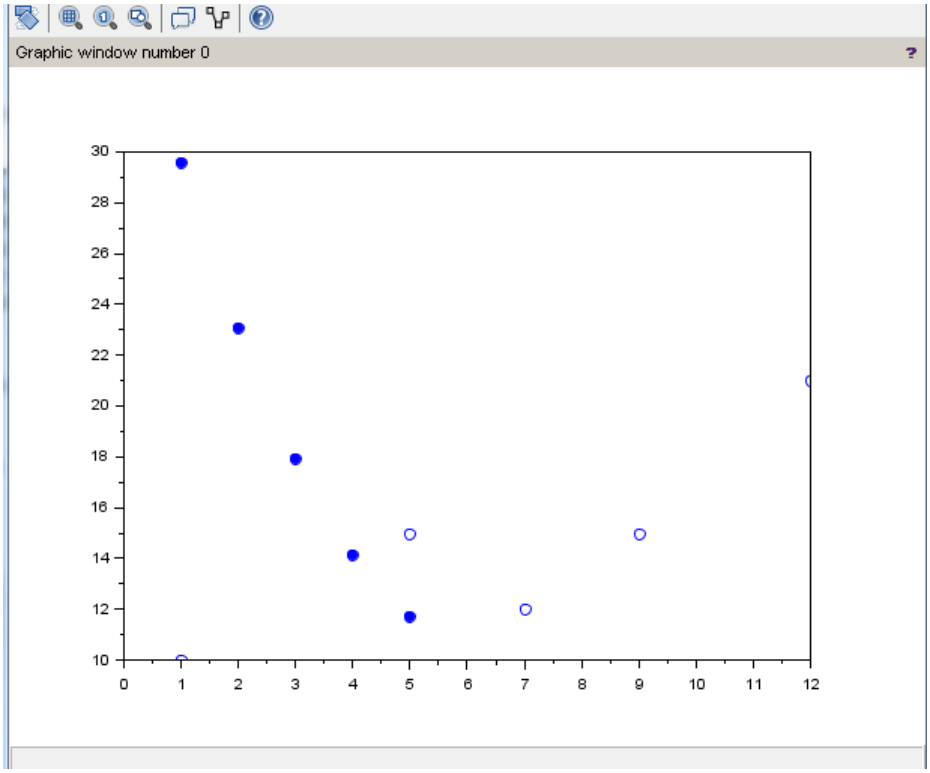
```
  "y = (9.4754)[(1.0608)^x]."

  "The required best fit curve is:"
```

Comparison Table

Xi	Yi	Yi (Calculated)	Distance Margin
1.0000	10.0000	10.0515	0.0515
5.0000	15.0000	12.7281	2.2719
7.0000	12.0000	14.3229	2.3229
9.0000	15.0000	16.1176	1.1176
12.0000	21.0000	19.2398	1.7602



```
 Do you want to input your own Xi values? Input yes to proceed and no to decline:  yes


 Please input your desired Xi matrix:  [1 2 3 4 5]


          Results Table

Xi              Yi (Calculated)
1.0000          29.5909
2.0000          23.0727
3.0000          17.9181
4.0000          14.1271
5.0000          11.6997


 Reinput Xi values again?: Input Yes to proceed and No to decline:
```



NONLINEAR REGRESSION: LOGARITHMIC (B)

```
"Program Mode: Nonlinear Regression"

"Nonlinear Type: Logarithmic"

"Type of Logarithmic:  y=ax^b"


Please input X matrix:
```

Please input X matrix: [1 5 7 9 12]

Please input Y matrix: [10 15 12 15 21]

Data Table

i	Xi	Xi=ln(x)	Yi	Yi=ln(yi)
1	1.0000	0.0000	10.0000	2.3026
2	5.0000	1.6094	15.0000	2.7081
3	7.0000	1.9459	12.0000	2.4849
4	9.0000	2.1972	15.0000	2.7081
5	12.0000	2.4849	21.0000	3.0445
Sum		8.2374		13.2482

XiYi	X^2
0.0000	0.0000
4.3584	2.5902
4.8354	3.7865
5.9502	4.8277
7.5653	6.1747
22.7093	17.3791

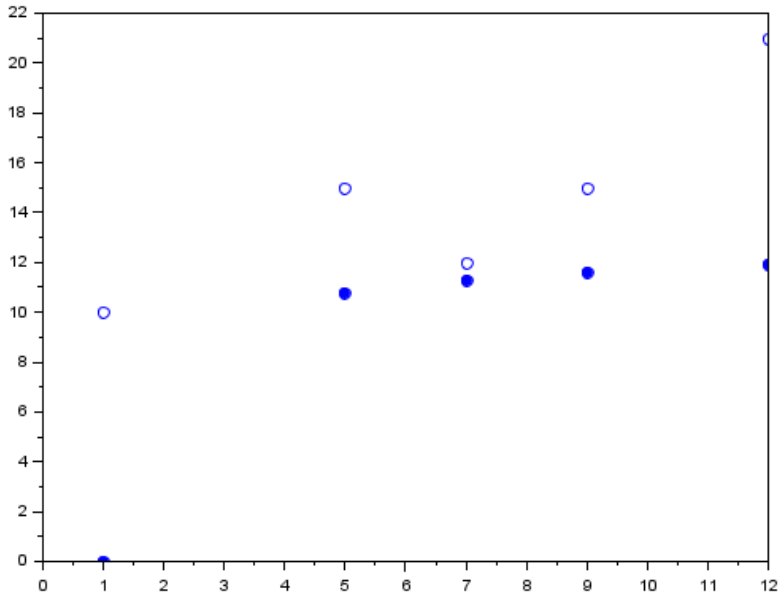
n	m	b
5	0.2319	9.6562

"y = (9.6562)[x^(0.2319)]."

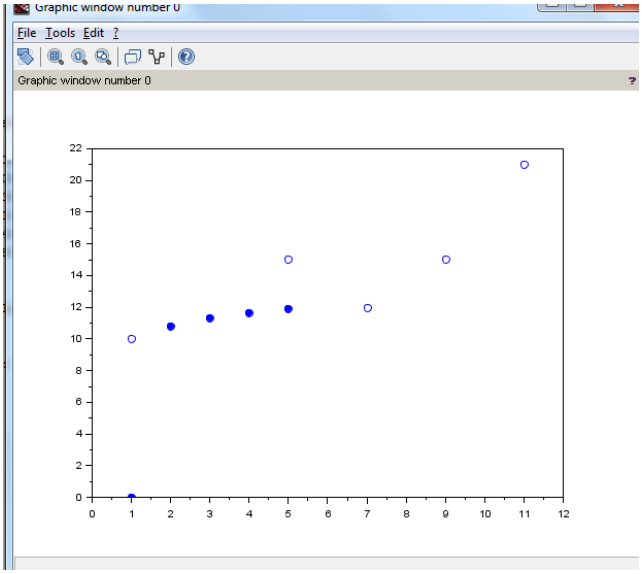
"The required best fit curve is:"

Comparison Table

Xi	Yi	Yi (Calculated)	Distance Margin
1.0000	10.0000	0.0000	10.0000
5.0000	15.0000	10.7828	4.2172
7.0000	12.0000	11.2682	0.7318
9.0000	15.0000	11.5901	3.4099
12.0000	21.0000	11.9255	9.0745




```
 Do you want to input your own Xi values? Input yes to proceed and no to decline:  YES

 Please input your desired Xi matrix:  [1 2 3 4 5]

          Results Table

Xi              Yi (Calculated)
1.0000          0.0000
2.0000          10.8332
3.0000          11.3197
4.0000          11.6424
5.0000          11.8803

 Reinput Xi values again?: Input Yes to proceed and No to decline:
```



NONLINEAR REGRESSION: LOGARITHMIC (C)

"Program Mode: Nonlinear Regression"

"Nonlinear Type: Logarithmic"

"Type of Logarithmic: y=ae^(bx)"

Please input X matrix: [1 5 7 9 12]

Please input Y matrix: [10 15 12 15 21]

Data Table

i	Xi	Yi	Yi=ln(yi)
1	1.0000	10.0000	2.3026
2	5.0000	15.0000	2.7081
3	7.0000	12.0000	2.4849
4	9.0000	15.0000	2.7081
5	12.0000	21.0000	3.0445
Sum	34.0000		13.2482

XiYi	X^2
2.3026	1.0000
13.5405	25.0000
17.3943	49.0000
24.3729	81.0000
36.5340	144.0000
94.1443	300.0000

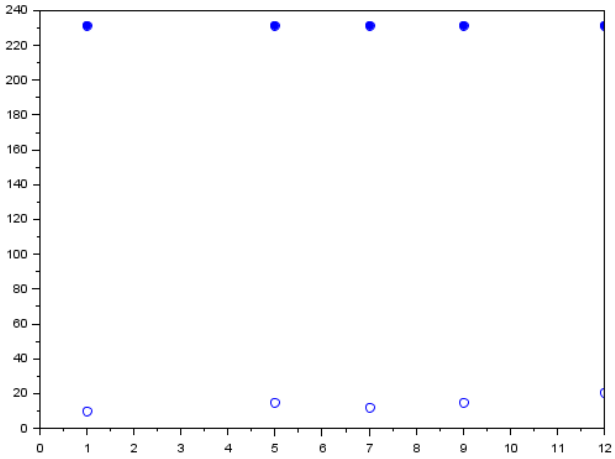
n	m	b
5	0.0590	9.4754

"y = e^(9.4754) + (0.059)x."

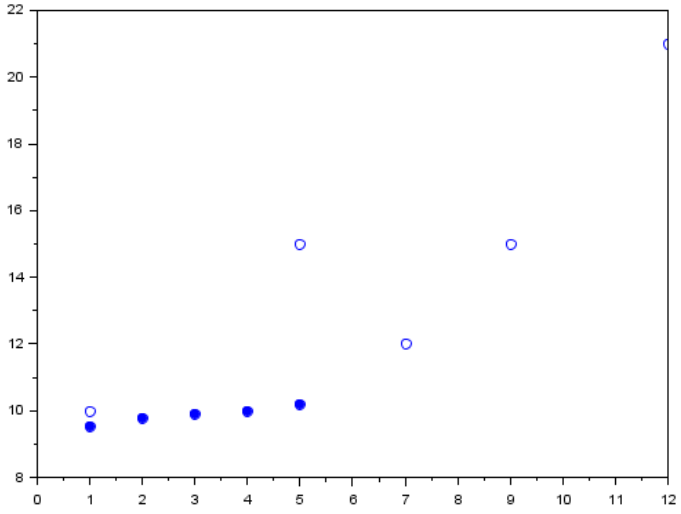
"The required best fit curve is:"

Comparison Table

Xi	Yi	Yi (Calculated)	Distance Margin
1.0000	10.0000	231.0590	221.0590
5.0000	15.0000	231.2950	216.2950
7.0000	12.0000	231.4130	219.4130
9.0000	15.0000	231.5310	216.5310
12.0000	21.0000	231.7080	210.7080




```
Do you want to input your own Xi values? Input yes to proceed and no to decline:  YES

Please input your desired Xi matrix:  [1 2 3 4 5]

          Results Table

Ki              Yi (Calculated)
1.0000          9.5344
2.0000          9.7704
3.0000          9.8884
4.0000          10.0064
5.0000          10.1834

Reinput Xi values again?: Input Yes to proceed and No to decline:
```



OPTIONS MENU: LINEAR REGRESSION & NONLINEAR REGRESSION (POLYNOMIAL OF DEGREE OF TWO)

```
Options:


a.) Go back to program selection menu

b.) Exit program


Choose desired action:
```

OPTIONS MENU: NONLINEAR REGRESSION (LOGARITHMIC)

```
Options:


a.) Go back to program selection menu

b.) Select another logarithmic type

c.) Exit program


Choose desired action:
```

Due to being designed in Scilab 6.0.2, the console screen appears much more cleaner when using Scilab 6.0.2 rather than the current updated version of Scilab. In Scilab 6.1.1, quotation marks are displayed which make it look messier whereas compared to Scilab 6.0.2, quotation marks are not displayed on the console screen.

– **Head Developer's Remark**

IV. Development Team Contributions

Development Team Members:

- ❖ Bernardo, Raevon Thaddeus C.
- Head Developer & Programmer
- Designed the algorithms of the working program
- Final debugger of the program

- ❖ Bertumen, Charles Jefferson
- Assistant Developer & Programmer
- Assisted in conceptualizing the algorithms of the program
- Assisted in assessing the performance of the trial version
- Assisted in debugging the program

- ❖ Cabanes, Christine Joy P.
- Assistant Developer & Programmer
- Assisted in conceptualizing the algorithms of the program
- Assisted in assessing the performance of the trial version
- Assisted in debugging the program

- ❖ Cesar, John Lester M.
- Assistant Developer & Programmer
- Assisted in conceptualizing the algorithms of the program
- Assisted in assessing the performance of the trial version
- Assisted in debugging the program

- ❖ Landicho, Bhaves Nicolette D.
- Assistant Developer & Programmer
- Assisted in conceptualizing the algorithms of the program
- Assisted in assessing the performance of the trial version
- Assisted in debugging the program

- ❖ Solis, Johnloyd P.
- Assistant Developer & Programmer
- Assisted in conceptualizing the algorithms of the program
- Assisted in assessing the performance of the trial version
- Assisted in debugging the program

The development of the program was conducted systematically in order to maximize work efficiency, therefore, the final output was the result of total team effort and cooperation.

Head Developer's Remark